TOPIC 8

LESSON 8.3b

Play It in Reverse

Objective

Solving One-Step Multiplication Equations

Warm-Up

Rewrite each fraction as a whole number times a unit fraction.

1. $3\frac{2}{7}$

2. $\frac{1}{12}$

EXPLORE 4

Solving Multiplication Equations Without Models

Like addition equations, all of the multiplication equations you have modeled in this lesson can be solved with one step. You can use the Properties of Equality and inverse operations to isolate the variable. What operation is the inverse of multiplication?

WORKED EXAMPLE

Solve the equation $4r = 32$.

$4r = 32$	
$4(1r) = 4(8)$	Write equivalent expressions with similar structure.
$\frac{4(1r)}{4} = \frac{4(8)}{4}$	Use inverse operations to reverse the multiplication of 4 and 1r.
$1r = 1(8)$	Perform division.
$r = 8$	Identity Property of Multiplication

1. Examine the worked example.

a. Check the solution to $4r = 32$.

b. Are there other solutions to the equation? How do you know?

2. Use the same strategy to solve each equation.

a. $8a = 72$

b. $11t = 132$

When you worked with one-step addition equations, you used the Subtraction Property of Equality to more efficiently solve the problem. Similarly, you can use the Division Property of Equality to solve multiplication problems.

3. Write the properties that justify each step.

$6w = 90$

$\frac{6w}{6} = \frac{90}{6}$ _____

$1w = 15$ _____

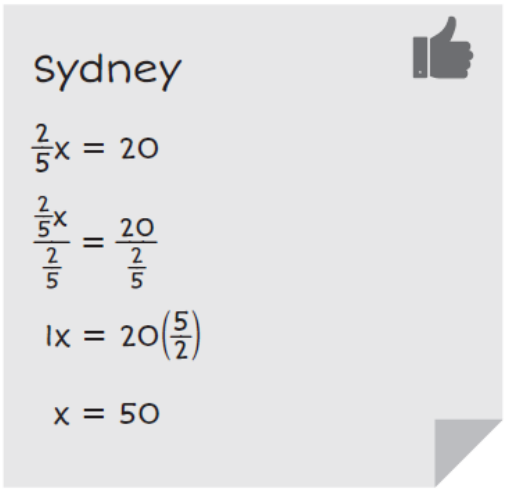
$w = 15$ _____

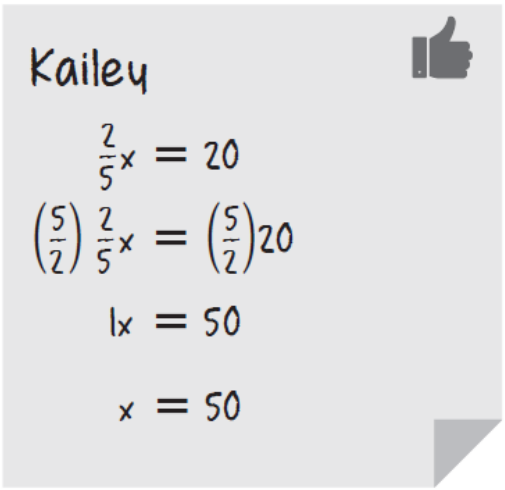
4. Diego and Venita are solving the equation $5 = \frac{p}{7}$.

a. Diego says that to solve $5 = \frac{p}{7}$, he would divide by 7.
The value of p that makes the equation true is $\frac{5}{7}$.
Venita disagrees and says that they should divide by $\frac{1}{7}$, and the solution is 35. Who is correct?

b. How can Diego and Venita check to see whose answer is correct?

5. Compare the solution strategies used by Sydney and Kailey.
What do you notice?





6. Solve each equation. Check to ensure that your solution makes the original equation a true statement.

a. $\frac{n}{7} = 7$

b. $18 = 3y$

c. $\frac{3}{2}h = \frac{5}{2}$

d. $3.14s = 81.2004$

e. $3\frac{1}{3} = \frac{3}{10}w$

f. $4.2k = 14.7$

EXPLORE 5

Reasoning About More Interesting Multiplication Equations

Recall that an equation is created by writing two expressions with an equals sign between them. Equations can be sometimes, always, or never true.

Consider the equation 7c = 28d.

1. How is this equation different from the equations you have solved in this lesson?

2. Generate at least 3 pairs of values for c and d that make the equation true.

3. What patterns do you notice?

You can use properties of arithmetic and algebra, along with the properties of equality, to solve for one of the variables in terms of the other variable.

WORKED EXAMPLE

	12a = 84b
Step 1	12a = (12 · 7)b
Step 2	12a = 12(7b)
Step 3	a = 7b

4. Analyze the worked example.

a. Why was 84 decomposed into 12 · 7?

b. What property was applied in Step 2?

c. Explain the reasoning from Step 2 to Step 3. Which property was used?

5. Jesse and Dominic each proposed a solution for the equation $7c = 28d$. Who's correct?

Jesse	Dominic
$7c = 28d$	$7c = 28d$
$7c = (7 \cdot 4)d$	$\left(\frac{4}{4}\right) 7c = 28d$
$7c = 7(4d)$	$\frac{(4 \cdot 7)c}{4} = 28d$
$c = 4d$	$\frac{c}{4} = d$

Use reasoning to solve each equation for one of the variables.

6. $18m = 54n$

7. $12s = \frac{1}{2}t$

Show You KNOW

What's Your Strategy?

Each equation in this lesson is written as $px = q$, where p and q are positive rational numbers and x is the unknown. You have investigated different strategies to solve these equations.

Analyze each given equation.

- Do you recognize a fact family relationship between the numerical coefficient and the constant?
- Is the numerical coefficient a whole number? A fraction? Or a decimal?
- Do you recognize a way to form a numerical coefficient of 1 using a Property of Equality?

$2n = 12$	$\frac{2}{5}x = 14$	$3x = 55$	$1.1m = 5.5$
$1.45r = 5.9$	$7h = 35$	$\frac{x}{4} = \frac{3}{8}$	$8r = \frac{3}{4}$

1. Sort each equation according to the solution strategy you think is most efficient.

Use Number Sense to Write Equivalent Expressions	Division Property of Equality	Multiplication Property of Equality

2. Provide a rationale for your choice of solution strategy or strategies.

Name: _____ Date: _____ Class: _____

Homework HW

LESSON 8.3b

Play It in Reverse

Objective Solving One-Step Multiplication Equations

Practice

1. Madison Middle School has a Math and Science Club that holds meetings after school. The club has decided to enter a two-day competition that involves different math and science challenges. The first day of competition involves solving multi-step math problems. Teams will receive two points for every problem they get correct in the morning session and three points for every question they get correct in the afternoon session.

a. Write an equation to represent the situation. Remember to define your variable(s).

b. The team scores four points in the morning session, but finishes the day with 28 points. Solve the equation and interpret the solution in the context of the problem.

c. The second day of the competition was the science portion, involving hands-on science problems.

Each correct science problem is worth 5 points. If the team started the day with 28 points and ended with 53 points, how many science problems did they get correct? Write and solve an equation to answer the question.

2. Employees at Driscoll's Electronics earn a base salary plus a 20% commission on their total sales for the year. Suppose the base salary is $40,000.

a. Write an equation to represent the total earnings of an employee. Remember to define your variable(s).

b. Stewart wants to make $65,000 this year. How much must he make in sales to achieve this salary? Write and solve an equation to answer this question.

c. Describe the equation 52,000 + 0.3s = 82,000 in terms of the problem situation.